



# Standard Test Method for Nitrogen Trichloride in Liquid Chlorine by High Performance Liquid Chromatography (HPLC)<sup>1</sup>

This standard is issued under the fixed designation E2036; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This test method uses high performance liquid chromatography (HPLC) to determine nitrogen trichloride levels in liquid chlorine at the 0.1 to 600  $\mu\text{g/g}$  (ppm) range. Solvent samples from chlorine production facilities containing very high concentrations of nitrogen trichloride may be analyzed by dilution with methanol.

1.2 Review the current safety data sheet (SDS) for detailed information concerning toxicity, first aid procedures, and safety precautions.

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* Specific hazard statements are given in Section 8.

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

**E180** Practice for Determining the Precision of ASTM Methods for Analysis and Testing of Industrial and Specialty Chemicals (Withdrawn 2009)<sup>3</sup>

**E806** Test Method for Carbon Tetrachloride and Chloroform in Liquid Chlorine by Direct Injection (Gas Chromatographic Procedure)

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee E15 on Industrial and Specialty Chemicals and is the direct responsibility of Subcommittee E15.02 on Product Standards.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

### 2.2 Federal Standards:<sup>4</sup>

**CFR 173 Title 49 Transportation; Shippers' General Requirements for Shipments and Packaging, including Sections:**

**173.304** Charging of Cylinders with Liquefied Compressed Gas

**173.314** Requirements for Compressed Gases in Tank Cars

**173.315** Compressed Gases in Cargo Tanks and Portable Tank Containers

### 2.3 Other Document:<sup>5</sup>

**Chlorine Institute Pamphlet No. 152** Safe Handling of Chlorine Containing Nitrogen Trichloride

## 3. Summary of Test Method

3.1 Weighed samples of chlorine are delivered into a cooled graduated centrifuge tube. One mL of cooled HPLC eluent is added before the chlorine is allowed to evaporate. After the chlorine has evaporated the remaining eluent is analyzed directly on the HPLC for nitrogen trichloride concentration.

3.2 In-process solvent samples from chlorine production facility may be analyzed by dilution in methanol followed by direct HPLC analysis of the diluted solution.

## 4. Significance and Use

4.1 This test method was developed for the determination of nitrogen trichloride in samples of carbon tetrachloride liquid taken from the compressor suction chiller bottoms of chlorine production plants and other places in the plants that may collect and concentrate nitrogen trichloride to levels that could explode. The test method was then modified to measure the lower levels of nitrogen trichloride observed in product liquid chlorine. This test method is sensitive enough to measure the levels of nitrogen trichloride observed in the normal production of liquid chlorine.

4.2 This test method for nitrogen trichloride will require the dilution (100:1) of highly concentrated in-process samples to bring them within the working range of the analysis.

<sup>4</sup> Available from U.S. Government Publishing Office, 732 N. Capitol St., NW, Washington, DC 20401-0001, <http://www.gpo.gov>.

<sup>5</sup> Available from The Chlorine Institute (CI), 1300 Wilson Blvd., Ste. 525, Arlington, VA 22209, <http://www.chlorineinstitute.org>.